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PHARMACOGNOSTIC ACCOUNT AND PHYTOCHEMICAL STUDIES OF *MORINGA OLEIFERA* LINN.

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Moringa oleifera, Antioxidant, Antimicrobial, Anti-inflammation properties

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ABSTRACT: *Moringa oleifera*, an important medicinal plant is one of the most widely cultivated species of the family Moringaceae. It is highly valued from time immemorial because of its vast medicinal properties. The present article provides all necessary information regarding its phytochemical investigations, morphological studies and medicinal properties like anaemia, anxiety, asthma, blackheads, blood impurities, bronchitis, catarrh, chest congestion, cholera, conjunctivitis, cough, diarrhoea, eye and ear infections, fever, abnormal blood pressure, pain in joints, scurvy, semen deficiency, headaches and tuberculosis. The aqueous extract of moringa used to treat corn, callus, cut, wounds and skin infection. The present study is that *Moringa oleifera* having the higher biological potential to treat calcium defitioancy. Every part of Moringa is said to have beneficial properties that can serve humanity so the whole plant can be extensively studied for further research aspects.

INTRODUCTION: In the last few decades there has been an exponential growth in the field of herbal medicine. It is getting popularized in developing and developed countries owing to its natural origin and lesser side effects [1]. Herbal drugs constitute a major share of all the officially recognized systems of health in India *viz.* Ayurveda, Yoga, Unani, Siddha, Homeopathy and Naturopathy, except Allopathy. More than 70% of India's 1.1 billion populations still use these non-allopathic systems of medicine [2]. In many developing countries, a large proportion of the population relies on traditional practitioners and their armamentarium of medicinal plants in order to meet health care needs.

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Although modern medicines may exist side-by-side with such traditional practice, herbal medicines have often maintained their popularity for historical and cultural reasons. Such products have become more widely available commercially, especially in developed countries. Use of herbal medicines in developed countries has expanded sharply in the latter half of the twentieth century. In India, herbal drugs are an integral part of The Indian System of Medicine (Ayurveda) which is an ancient and mainstream system [3].

The evaluation of various plant products according to their traditional uses and medicinal value based on their therapeutic efficacy leads to the discovery of newer and recent drugs for treating various ailments. This fact forms the basis for the development of new drugs from various plant sources. One of such plants of medicinal value is *Moringa olifera*, belonging to the family Moringaceae, commonly known as 'Sahajan' in Hindi, Horse radish in English.

It is a small, fast, growing, evergreen, or deciduous tree that usually grows upto 10 or 12 m in height. It is distributed among Sub Himalayan Tracts, Assam, Bengal and Peninsular India [4]. Various properties are attributed to it like antispasmodic, diuretic, expectorant and abortifacient [5].

Moringa oleifera commonly known as Moringa, drumstick tree, horseradish tree, ben oil tree, or benzoil tree is the only genus in the family Moringaceae. The plant is native to north-western India, and widely cultivated in tropical and subtropical areas. It is the most widely cultivated species of the genus Moringa, and its young seed pods and leaves are used as vegetables. All parts of the Moringa tree are edible and have long been consumed by humans. Moringa is used worldwide in the traditional medicine, for various health conditions, such as skin infections, anemia, anxiety, asthma, blackheads, blood impurities, bronchitis, catarrh, chest congestion, cholera, infections, fever, glandular, swelling, headaches, abnormal blood pressure, hysteria, pain in joints, pimples, psoriasis, respiratory disorders, scurvy, semen deficiency, sore throat, sprain, tuberculosis, for intestinal worms, lactation, diabetes, and pregnancy. In many regions of Africa, it is widely consumed for self-medication by patients affected by diabetes, hypertension, or HIV/AIDS.

Moringa oil has tremendous cosmetic value and is used in body and hair care as a moisturizer and skin conditioner. It has been shown that aqueous, hydroalcohol, or alcohol extracts of *M. oleifera* leaves possess a wide range of additional biological activities including antioxidant, tissue protective (liver, kidneys, heart, testes, and lungs), analgesic, antiulcer, antihypertensive, radio-protective, and immunomodulatory actions. Phytochemical analyses have shown that *M. oleifera* is a rich source of potassium, calcium, phosphorous, iron, Vitamins A and D, essential amino acids, as well as known antioxidants, such as β-carotene, Vitamin C, and flavonoids.

A wide variety of polyphenols and phenolic acids as well as flavonoids, glucosinolates, and possibly alkaloids are believed to be responsible for the effects of the plant. This chapter is intended to compile the pharmacological effects of *M. oleifera* as well as its phytochemical constituents.

Plant Profile:

Taxonomic Classification:

Kingdom: Plantae
Sub kingdom: Tracheobionta
Super Division: Spermatophyta
Division: Magnoliophyta
Class: Magnoliopsida
Subclass: Dilleniidae
Order: Capparales
Family: Moringaceae
Genus: *Moringa*
Species: *oleifera*

Botanical Description:

Synonyms Latin: *Moringa oleifera*
Sanskrit: Subhanjana
Hindi: Saguna, Sainjna Gujarati - Suragavo
Tamil: Morigkai
Telugu: Mulaga, Munaga
Malayalam: Murinna, Sigru
Punjabi: Sainjna, Soanjna
Unani: Sahajan
Arabian: Rawag
French: Moringe à graine ailée, Morungue
Spanish: Angela, Ben, Moringa
Portuguese: Moringa, Moringueiro
Chinese: La ken
English: Drumstick tree, Horseradish tree, Ben tree
Ayurvedic: Akshiva, Haritashaaka, Raktaka, Tikshnagandhaa

Geographical Source: The tree is wild in the Sub-Himalayan tracts from Chenab to Oudh. It grows at elevations from sea level to 1400 m.

It is very commonly cultivated near houses in Assam, Bengal and peninsular India. It is a prolific coppicer [4]. It is also cultivated in North-Eastern Pakistan, North-Eastern Bangladesh, Sri Lanka, West Asia, the Arabian Peninsula, East and West Africa, throughout the West Indies and southern Florida, in Central and South America from Mexico to Peru, as well as in Brazil and Paraguay [6].

Morphology: *Moringa oleifera* is a small, fast-growing evergreen or deciduous tree that usually grows as high as 9 m, with a soft and white wood and corky and gummy bark. Roots have the taste of horseradish. Leaves are longitudinally cracked leaves, 30 - 75 cm long main axis and its branch jointed, glandular at joints, leaflets are glabrous and

entire. The leaflets are finely hairy, green and almost hairless on the upper surface, paler and hairless beneath, with red-tinged mid-veins, with entire (not toothed) margins, and are rounded or blunt-pointed at the apex and short-pointed at the base. The twigs are finely hairy and green. Flowers are white, scented in large axillary down panicles, pods are pendulous, ribbed, seeds are 3-angled [4, 6].

FIG. 1: *MORINGA OLEIFERA* LINN.

FIG. 2: MORINGA LEAVES

FIG. 3: MORINGA DRUMSTICK

FIG. 4: DRIED LEAVES OF MORINGA

Microscopical Characteristics:

Microscopy of the Root of *Moringa oleifera*:

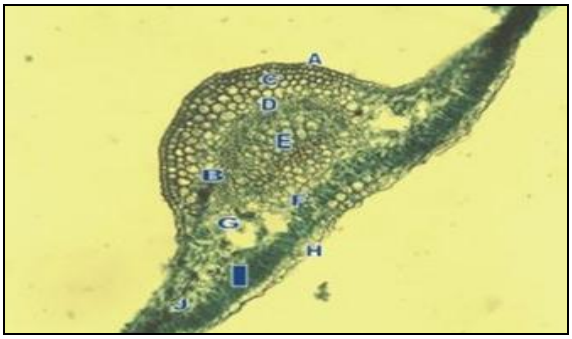

FIG. 5: TRANSVERSE SECTION OF THE LEAF OF *MORINGA OLEIFERA*

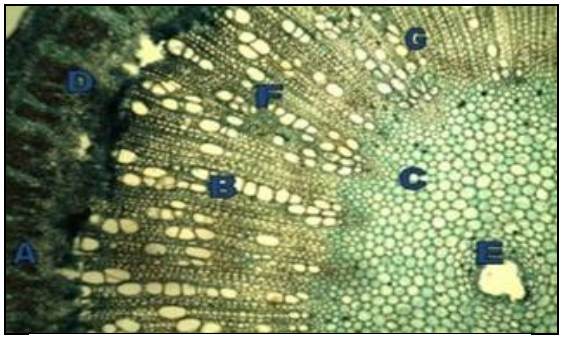

FIG. 6: TRANSVERSE SECTION OF THE STEM OF *MORINGA OLEIFERA*

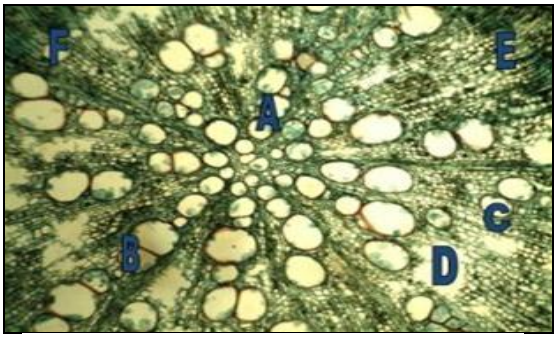

FIG. 7: TRANSVERSE SECTION OF THE ROOT OF *MORINGA OLEIFERA*

Key: (**Fig. 5**) A- Upper epidermis; B- Starch granules; C-Collenchyma; D- Spongy parenchyma; E- Xylem; F- Phloem; G- Respiratory cavity; H- Lower epidermis; I- Lower cylindrical palisade cells; J- Border sclerenchyma

Key: (**Fig. 6**) A- Bark; B-Xylem; C- Pith; D-Cortex; E- Cambial ring (showing secondary thickening); F- Medullary ray; G- Parenchyma

Key: (**Fig.7**) A- Primary xylem; B- Secondary xylem; C- Medullary ray; D- Intercellular air space; E- Cambium; F- Bark

Phytochemistry: The isolation of 4 (alpha-L-Rhamnosyloxy) benzyl isothiocyanate form seeds of *Moringa oleifera* [7]. I. M. Villasenor *et al*., (1989) reported certain biosynthetically and chemically related compounds from roasted seeds of *Moringa oleifera*. Their structures have been elucidated by spectral analysis as 4 (-L-rhamnosyloxy) phenylacetonitrile, 4-hydroxyphen ylacetonitrile, and 4-hydroxyphenyl-acetamide [8, 9].

The isolation of two nitrile glycosides from the ethanolic extracts of *Moringa oleifera* leaves, niazirin and niazirinin and three mustard oil glycosides, 4-[(4'-O-acetylalpha-L-rhamnosyloxy) benzyl] isothiocyanate, niaziminin A, and niaziminin B. Niazirinin is a new compound. Niaziminins A and B have previously been obtained from the left extract as a mixture, while 4-[(4'- O- acetyl- alpha- l-rhamnosyloxy)benzyl]iso thiocyanate is new from this source. Structural determination was accomplished by means of spectroscopic methods including appropriate 2D nmr experiments and chemical reactions. This is the first report of the isolation of nitriles, an isothiocyanate, and thiocarbamates from the same plant species [10].

Isolated six new and three synthetically known glycosides from the leaves of *Moringa oleifera*, employing a bioassay-directed isolation method on the ethanolic extract. Most of these compounds, bearing thiocarbamate, carbamate or nitrile groups, are fully acetylated glycosides, which are very rare in nature. Elucidation of the structures was made using chemical and spectroscopic methods, including 2D NMR techniques [11].

TABLE 1: PHYTOCHEMICAL SCREENING OF *MORINGA OLEIFERA*

Phytochemicals	Leaf	Stem	Root
Tannins	+	–	–
Saponins	++	++	+
Alkaloids	+++	–	+
Resins	+	–	–
Steroids	–	++	+
Terpenoids	–	+	+
Flavonoids	+	–	–
Carbohydrates	++	++	+++
Proteins	+++	++	+

Key: + = Slightly Present, ++ = Present, +++ = Highly Present, – = Absent

Isolated two new compounds from the ethanolic extract of whole pods of Moringa oliefera, O-[2'-hydroxy-3'-(2''-heptenyloxy)]-propyl undecanoate and O- ethyl- 4 [(alpha-L-rhamnosyloxy)-benzyl] carbamate along with the known substances like methyl phydroxybenzoate and beta-sitosterol [12].

Isolated niaziminin, a thiocarbamate from the leaves of Moringa oleifera [13]. A. P. Guevara *et al*., (1999) investigated the ethanolic extracts of the seeds of Moringa oleifera and isolated a new compound O- ethyl- 4- (alpha- L- rhamnosyloxy) benzyl carbamate together with seven known compounds, 4 (alpha-L-rhamnosyloxy)-benzyl isothiocyanate, niazimicin, niazirin, beta-sitosterol, glycerol-1-(9-octadecanoate), 3- O- (6'-O oleoyl-beta-D-glucopyranosyl)-beta-sitosterol and beta-sitosterol-3-O-beta-D-glucopyranoside [14].

Isolated various glucosinolates and phenolic compounds from various parts of *Moringa oleifera*. The seeds only contained 4- (alpha- l-rhamno pyranosyloxy) benzylglucosinolate at high concentrations. Roots of *Moringa oleifera* contains high concentrations of both 4-(alpha-l-rhamno pyranosyloxy) - benzylglucosinolate and benzyl glucosinolate. Leaves of the plant contains 4-(alpha-l-rhamnopyranosyloxy)-benzylglucosinolate and three monoacetyl isomers of this glucosinolate. Only 4- (alpha- l- rhamnopyranosyloxy) benzyl glucosinolate was detected in Moringa oleifera bark tissue.

The leaves also contains quercetin-3-O-glucoside and quercetin- 3- O- (6''-malonyl-glucoside), and lower amounts of kaempferol-3-O-glucoside and kaempferol- 3- O- (6''- malonyl-glucoside), 3 caffeoylquinic acid and 5-caffeoylquinic acid [18].

Dried leaves of *Moringa oliefera* [19]. Isolated aglycone of Deoxy - Niazimicine which is characterized as N-benzyl; S-ethyl thioformate from the chloroform extract of *Moringa oleifera* roots barks [15]. Phytochemical studies on Moringa oleifera by revealed major polyphenols such as quercetin glucosides, rutin, kaempferol glycosides and chlorogenic acids in *Moringa oleifera* powder by HPLC analysis [16].

The isolation of five flavonol glycosides characterised as kaempferide 3- O- (2'', 3''-diacetylglucoside), kaempferide, 3- O- (2''-Ogallo ylrhamnoside), kaempferide, 3-O-(2''-O-galloyl-rutinoside)-7-Oalpha-rhamnoside, kaempferol, 3-O- [beta- glucosyl-(1→2)]- [alpha-rhamnosyl-

(1→6)]-beta-glucoside- 7- Oalpharhamnoside and kaempferol 3-O-[alpha-rhamnosyl-(1 → 2)]-[alpha-rhamnosyl- (1→4)]betaglucoside- 7- O- alpha-rhamnoside together with benzoic acid 4-O-beta-glucoside, benzoic acid 4-O-alpha-rhamnosyl-(1 → 2)-beta-glucoside and benzaldehyde 4-O-beta-glucoside have been isolated from methanolic extract of *Moringa oleifera* leaves. Also obtained from the same extract were known compounds, kaempferol 3- O- alpha-rhamnoside, kaempferol, syringic acid, gallic acid, rutin and quercetin 3-O-beta-glucoside. Their structures were determined using spectroscopic methods as well as comparison with data from known compounds [17].

Isolated a water-soluble polysaccharide from the aqueous extract of pods of *Moringa oleifera*. The polysaccharide contains d-galactose, 6-O-Me-D-galactose, Dgalacturonic acid, l-arabinose, and l-rhamnose in a molar ratio of 1:1:1:1 [23]. F. Anwar and U. Rashid (2007) reported various sterols, tocopherols and fatty acids present in the seeds and seed oil from the *n*-hexane extract. Among the sterols, stigmasterol has the highest percentage (18.8%), whereas among the tocopherols, α – tocopherol was present in high amount (140.5 mg/kg) [18].

Traditional Uses: Traditionally, the plant is used as antispasmodic, stimulant, expectorant and diuretic. Fresh root is acrid and vesicant (has the taste of horse-radish). Internally it is used as stimulant, diuretic and antilithic. Gum is bland and mucilaginous. Seeds are acrid and stimulant. Bark is emmenogogue and even abortifacient, antifungal, antibacterial. Flowers are cholagogue, stimulant, tonic and diuretic and useful to increase the flow of bile. The plant is also a cardiac circulatory tonic and antiseptic [21].

Pods are antipyretic, anthelmintic; fried pods are used in diabetes. Root juice is employed in cardiac tonic, antiepileptic. Used for nervous debility, asthma, enlarged liver and spleen, deep seated inflammation and as diuretic in calculus affection. Decoction is used as a gargle in hoarseness and sore throat. Root and fruit are antiparalytic. Leaf juice is used in hiccough (emetic in high doses); cooked leaves are given in influenza and catarrhal affections.

Root-bark is used as antiviral, anti-inflammatory, analgesic. Stem-bark and flowers are hypo-glyceamic. Infusion of seed is anti-inflammatory, antispasmodic and diuretic, also given in venereal diseases. Along with other therapeutic applications. The Ayurvedic Pharmacopoeia of India indicated the use of the dried root bark in goitre, glycosuria and lipid disorders (also dried seeds), and leaf, seed, root bark and stem bark in internal abscess, piles [22].

CONCLUSION: The source of many plants can often be identified from the peak pattern of the chromatograms obtained directly from headspace analysis. The present study, which reveals the presence of components in *M. oleifera* suggest that the contribution of these compounds on the pharmacognostic account and phytochemical investigation should be evaluated. The study was confirm that active constituents are used to treat skin infection, cut, wounds. Plant are having the biological potentioal anti-inflamation, antiseptic, antimicrobial property.

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CONFLICTS OF INTEREST: Nil

REFERENCES:

1. Brahmachari UN: Current Science, 2001; 81(1): 15-16.
2. Vaidya ADB and Devasagayam TPA: Journal of Clinical Biochemistry and Nutrition 2007; 41: 1-11.
3. Rai J: JK Science 2005; 7: 180.
4. Gupta RK: Medicinal and Aromatic Plants. CBS publishers and distributors 2010; 151-52.
5. Nadkarni KM: Indian Materia Medica. Bombay Popular Prakashan 2009; 1: 811-16.
6. Roloff A, Weisgerber H, Lang U and Stimm B: Enzyklopädie der Holzgewächse, Handbuch und Atlas der Dendrologie 2009; 1-8.
7. Villasenor IM, Lim-Sylianco CY and Dayrit F: Mutat Res. 1989; 224(2): 209-12.
8. Rastogi RP and Mehrotra BN: Compendium of Indian Medicinal plants. Central Drug Research Institute, Lucknow and National institute of science communication and information resources, New Delhi 2004; 5: 551-52.
9. Faizi S, Siddiqui BS, Saleem R, Siddiqui S, Aftab K and Gilani AH: J Nat Prod., 1994; 57(9): 1256-61.
10. Faizi S, Siddiqui BS, Saleem R, Siddiqui S, Aftab K and Gilani AH: Phytochemistry 1995; 38(4): 957-63.

11. Faizi S, Siddiqui BS, Saleem R, Siddiqui S, Aftab K and Gilani AH: Planta Medica 1998; 64(3): 225-28.
12. Murakami A, Kitazono Y, Jiwajinda S, Koshimizu K and Ohigashi H: Planta Medica 1998; 64(4): 319-23.
13. Guevara AP, Vargas C, Sakurai H, Fujiwara Y, Hashimoto K, Maoka T, Kozuka M, Ito Y, Tokuda H and Nishino H: Mutat Res. 1999; 440(2): 181-88.
14. Bennett RN, Mellon FA, Foidl N, Pratt JH, Dupont MS, Perkins L and Kroon PA: J Agric Food Chem. 2003; 51(12): 3546-53.
15. Siddhuraju P and Becker K: J Agric Food Chem. 2003; 51(8): 2144-55.
16. Nikkon F, Saud ZA, Rahman MH and Haque ME: Pakistan Journal of Biological Sciences 2003; 6(22): 1888-90.
17. Ndong M, Uehara M, Katsumata S and Suzuki K: J Clin Biochem Nutr. 2007; 40(3): 229-33.
18. Manguro LO and Lemmen P: Nat Prod Res. 2007; 21(1): 56-68.
19. Roy SK, Chandra K, Ghosh K, Mondal S, Maiti D, Ojha AK, Mondal S, Chakraborty I and Islam SS: Carbohydr Res. 2007; 342(16): 2380-89.
20. Anwar F and Rashid U: Pak. J. Bot., 2007; 39(5): 1443-53.
21. Nadkarni KM: Indian Materia Medica. Bombay Popular Prakashan, 2009; 1: 811-16.
22. Roloff A, Weisgerber H, Lang U and Stimm B: Enzyklopädie der Holzgewächse, Handbuch und Atlas der Dendrologie 2009; 1-8.
23. Khare CP: Indian medicinal plants. Springer 2007; 422-23.

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